IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	Attorney Docket No. 2005_1996A
Katsuhito MIURA et al.	:	**Confirmation No. 3768**
Serial No. 10/561,038	:	Group Art Unit 1795
Filed December 16, 2005	:	Examiner Ben Lewis
CROSSLINKED POLYMER ELECTROLYTE AND USE THEREOF	:	**Mail Stop: AF**

REQUEST FOR RECONSIDERATION AFTER FINAL REJECTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Responsive to the Office Action of January 27, 2010, Applicants submit the following remarks in support of the patentability of the presently claimed invention over the disclosures of the references relied upon by the Examiner in rejecting the claims. Further and favorable reconsideration is respectfully requested in view of these remarks.

Consideration After Final Rejection

Although this amendment is presented after final rejection, the Examiner is respectfully requested to enter and consider the remarks, as they place the application in condition for allowance.

Rejections Under 35 U.S.C. § 103(a)

Claims 1-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kohjiya et al. (US 5,837,157) in view of Miura et al. (US 6,159,389).

Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Kohjiya et al. (US '157) in view of Miura et al. (US '389).

These rejections are respectfully traversed.

The USPTO is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17, and 1.492, which may be required by this paper to Deposit Account No. 23-0975.

The Position of the Examiner

The Examiner takes the position that Kohjiya et al. disclose a polymer solid electrolyte comprising a polyether copolymer having an oligooxyethylene side chain and an electrolyte salt compound which is soluble in the polyether copolymer. The Examiner further asserts that the reference teaches the polyether polymer being a solid random copolymer having a main chain structure consisting of 5 to 30 molar % of a structural unit of formula (1) and 95 to 70 molar % of a structural unit of formula (2). The Examiner asserts that the Kohjiya et al. polymer composition comprises only two polymers of formula (1) and (2), which *allegedly* read on Applicants' formula (i) and (ii). The Examiner also asserts that Kohjiya et al. teach tetrahydrofuran as a solvent. However, the Examiner admits that Kohjiya et al. do not specifically teach an additive as an optical ingredient. The Examiner relies on Miura et al. as disclosing a polyether copolymer wherein tetraethylene glycol dimethacrylate was added as a crosslinking agent.

Accordingly, the Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the additive of Miura et al. into the polymer solid electrolyte of Kohjiya et al. to improve polymer mechanical strength.

Applicants' Arguments

Applicants respectfully disagree with the Examiner's position for the following reasons.

Applicants' independent claim 1 recites a polymer electrolyte composition comprising:

(1) a crosslinked material of a polyether binary copolymer which has a main chain consisting of repeating units of formula (i) and crosslinking units of formula (ii), and which has a weight-average molecular weight of 10^4 to 10^7,

$$-\!\!\left(\!-CH_2-CH_2-O-\!\right)\!\!- \qquad \text{(i)}$$

$$-\!\!\left(\!-CH_2-\underset{\displaystyle R^1}{\underset{|}{C}H}-O-\!\right)\!\!- \qquad \text{(ii)}$$

wherein R^1 is an ethylenically unsaturated group having an ester linkage,

(2) an electrolyte solution comprising an aprotic organic solvent,

(3) an additive, as an optical ingredient, which comprises an ether compound having an ethylene oxide unit, and

(4) an electrolyte salt compound comprising a lithium salt compound.

Accordingly, in order for the prior art to render Applicants' claims obvious, it is necessary that the combination of references relied upon by the Examiner teach **each** of the above-identified components.

Both Kohjiya et al. and Miura et al. are related to a **solid** electrolyte, which does not contain an electrolyte solution. On the contrary, the presently claimed invention relates to a gel electrolyte, which **comprises an electrolye solution**. Please see item 2 of the claim, requiring an electrolyte solution comprising an aprotic organic solvent. Accordingly, the presently claimed invention is distinct from the teachings of the cited references in that the electrolyte of the presently claimed invention contains an electrolyte solution.

The following arguments are provided to demonstrate the distinction between the **solid** electrolyte of the cited references, and the gel electrolyte of Applicants' claims, which contains an electrolyte solution.

In the case of a **solid electrolyte battery**, a solid electrolyte composition containing the polymer is dissolved in a solvent, the solution is cast flatwise, and the solvent is eliminated to give a film. When the battery is used after the film is incorporated in the battery, the film will be deformed and/or melted at a high temperature environment. Because the short circuit of a cathode and an anode is occasionally caused, a separator is essential as a battery member, in the solid electrolyte battery.

It is necessary to maintain the high temperature shape stability of the film to avoid the short circuit. In the Miura et al. reference, in order to avoid the short circuit, a monomer having a double bond is incorporated in a polymer, a solid electrolyte composition containing the polymer is dissolved in a solvent, the solution is cast flatwise, the solvent is eliminated to give a film, and the film which has high temperature shape stability is obtained by curing the film by heat and/or light.

The monomer having the double bond is used in Miura et al. and the present invention. As discussed above, in Miura et al., the object of using the monomer having the double bond is to give the shape stability of the film. In contrast, in the present invention, the monomer having

the double bond is used as an essential component to give a matrix for the gel electrolyte, i.e. an electrolye composition comprising an electrolyte solution.

If the polymer having only the repeating units (i) (without the repeating unit (ii) having the double bond) is combined with the electrolyte solution, a sol is merely obtained so that a gel cannot be obtained. The incorporation of the repeating unit (ii) provides a suitable matrix for the gel electrolyte.

In summary, Kohjiya et al. and Miura et al. both use a solid film, which is **free from a solvent**, and the present invention uses a gel which contains an electrolyte solution (or solvent). The solid film in Kohjiya et al. and Miura et al. is quite different from the composition of Applicants' claims.

Although, both Miura et al. and the present invention use the monomer having the double bond, Miura et al. use the monomer having the double bond for the purpose of giving the shape stability of the solid film at high temperature, while the present invention uses the monomer having the double bond for the purpose of **providing a stable gel**. Thus, the idea is quite different between the presently claimed invention and the cited references.

Further, the ionic conductivity is 3.1×10^{-5} to 1.5×10^{-6} in the working examples of Miura et al., while the ionic conductivity is 8.3×10^{-4} (Example 1, page 23) to 1.1×10^{-3} (Example 2, page 24) in the working examples of the present invention. Accordingly, the ionic conductivity in Applicants' invention is larger in at least one order of magnitude than that in Miura et al.

For these reasons, the invention of claims 1-8 is clearly patentable over the cited references.